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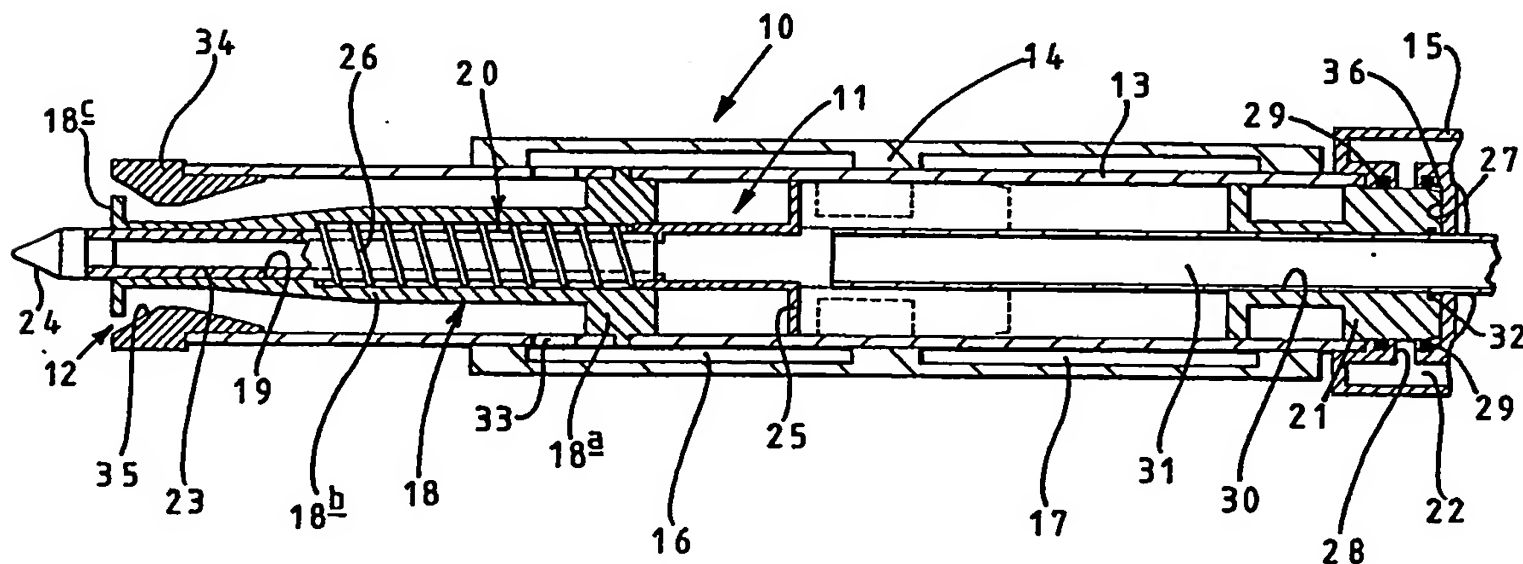
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A5A A20X5

(56) Documents cited
GB 0587639 A US 5062486 A US 4832265 A
US 4625808 A US 4147216 A US 2857005 A

(58) Field of search
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(54) Fire-fighting aid suitable for use with aircraft

(57) A fire-fighting aid comprises a piercing device (11) for piercing a hole in a structure e.g. an aircraft fuselage, in combination with a nozzle (12) for supplying a fire-controlling fluid through a hole formed in the structure by the piercing device. The piercing device comprises a piercing tool (20), means (18) supporting the piercing tool for movement between a retracted position and an extended position, and means, e.g. piston (21) and gas reservoir (22), for applying a force to the piercing tool to drive the piercing tool from its retracted position to its extended position so as to form a hole in the structure.



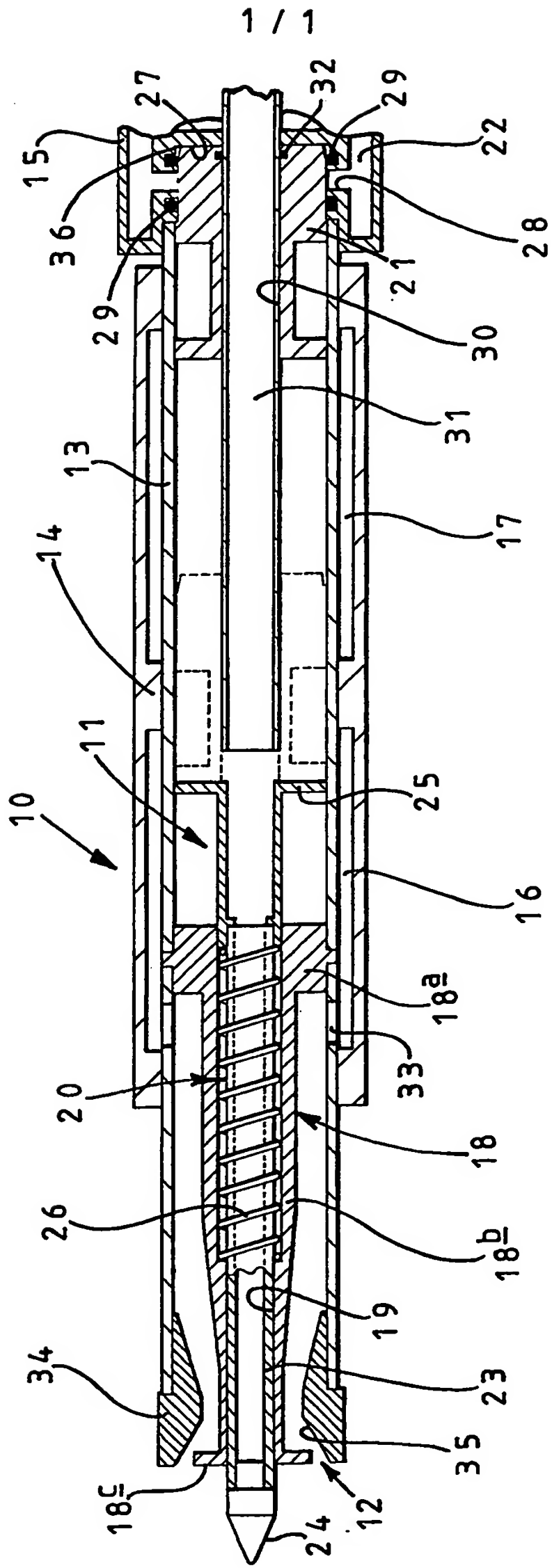
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The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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FIRE-FIGHTING AID

This invention relates to a fire-fighting aid,
5 and more particularly but not exclusively to such an aid
for fighting aircraft fires.

In an airfield emergency, an aircraft fire
must be tackled with the minimum of delay. If the fire
10 is in the aircraft, fire-controlling fluid must be
supplied to the interior of the aircraft as quickly as
possible as a flash-over fire can spread over the
entire length of the fuselage of the aircraft in a
matter of seconds. Thus, it may be necessary to make a
15 hole in the fuselage of the aircraft and then supply a
fire-controlling fluid via the hole to the interior of
the aircraft.

According to the present invention there is
20 provided a fire-fighting aid comprising a piercing
device for piercing a hole in a structure, such as an
aircraft fuselage, in combination with a nozzle for
supplying a fire-controlling fluid through a hole formed
in the structure by the piercing device, the piercing
25 device comprising a piercing tool, means supporting the
piercing tool for movement between a retracted position
and an extended position, and means for applying a
force to the piercing tool to drive the piercing tool

from its retracted position to its extended position to
in use form a hole in the structure.

Preferably, the nozzle and piercing device
5 have a common body and in this case the nozzle may
surround the piercing tool in the body.

In one embodiment, the force applying means
may comprise a piston slidable between a first position
10 remote from the piercing tool and a second position in
which it impacts with the piercing tool to drive the
piercing tool from its retracted to its extended
position, and means for propelling the piston towards
its second position. In another embodiment, the piston
15 and the piercing tool may be of unitary construction.
In either case, the propelling means may comprise a gas
reservoir for supplying pressurised gas to one end of
the piston when the piston has been moved away from its
first position and means for moving the piston away from
20 its first position so that in use said one end of the
piston is exposed to pressurised gas in the gas
reservoir.

The fire-fighting aid may be in the form of a
25 hand-holdable aid or may be in a form which can be
mounted on an extendible/retractable boom.

The invention will now be more particularly

described, by way of example, with reference to the accompanying drawing which is a sectional view of one embodiment of a fire-fighting aid according to the invention.

5

Referring now to the drawing, the fire-fighting aid shown therein comprises a barrel-shaped body 10 accommodating a piercing device 11 and a nozzle 12.

10

The body 10 comprises an inner tubular part 13, an outer tubular part 14, and an end part 15. The inner tubular part 13 projects from opposite ends of the outer tubular part 14 and annular chambers 16 and 17 are provided between the inner and outer tubular parts 13 and 14, respectively.

The piercing device 11 comprises a support member 18 having a through bore 19 therein, a piercing tool 20 slidable in the through bore 19 of the support member 18, a piston 21, and a propulsion system including a gas reservoir 22 in the end part 15.

The support member 18 is mounted in one end of the inner tubular part 14 and comprises, at its inner end, a mounting portion 18a which is fixed to the inner tubular part 13 and, at its outer end, a generally tubular part 18b which together with the inner tubular

part 13 defines the nozzle 12.

The piercing tool 20 comprises a hollow stem 23, a solid point 24 at the outer end of the stem, and
5 an anvil 25 at the inner end of the stem. A coiled compression spring 26 is provided in the generally tubular part 18b of the support member 18 and urges the piercing tool 20 towards a retracted position as shown in the drawing.

10

The end part 15 is fixed to the end of the inner tubular part 13 remote from the nozzle 12 and the piston 21 is slidable in the inner tubular part 13 between the end part 15 and the anvil 25.

15

The end part 15 has a recess 27 for receiving the end of the piston 21 remote from the nozzle 12 and an annular port 28 which communicates the gas reservoir 22 with the recess 27 at a position intermediate the
20 inner and outer ends of the recess 27. "O" ring seals 29 are provided on opposite sides of the annular port 28 and these make sealing contact with the piston 27 when the latter extends into the recess 26 as far as is possible.

25

The piston 21 has a through bore 30 therein to receive a vent tube 31 which extends through the end part 15 and into the inner tubular part 13 of the body

10. An "O" ring seal 32 is provided in the bore 30 of the piston to seal against the vent tube 31.

The chamber 16 is connected to a source of a
5 fire-controlling fluid, e.g. water, and this chamber communicates with the nozzle 12 via ports 33 in the inner tubular part 13.

The outer end of the inner tubular part 13 has
10 an end piece 34 which has a divergent mouth 35 and the outer end of the support member 18 has a radially outwardly extending flange 18c which co-operates with the divergent mouth 35 to ensure that the fire-controlling fluid discharged by the nozzle 12 is well
15 dispersed.

The fire-fighting aid described above is intended primarily for fighting an aircraft fire in an airfield emergency. The aid may be in the form of a
20 hand held aid or may be mounted on a telescopic boom of an airfield fire fighting vehicle. The aid can be used to pierce the fuselage of an aircraft and then supply a fire-controlling fluid to the interior of the aircraft in order to try to prevent a flash-over fire which could
25 spread through the entire length of the fuselage in a matter of seconds and kill those on board. The aid will be used primarily on aircraft windows as these are visible and inherently weak parts of the aircraft

structure.

In operation, the point 24 of the piercing tool 20 is placed close to an aircraft window and a valve (not shown) is operated to supply gas (e.g. air) under pressure via a pilot line indicated at 36 to the inner end of the recess 27. This gas will move the piston 21 away from the inner end of the recess 26. When the end of the piston 21 remote from the nozzle 12 passes the first of the two "O" ring seals 29, the piston is suddenly exposed to the full pressure of the compressed gas (e.g. air) in the reservoir 22 and this will propel the plunger 21 towards the anvil 25 at high speed. The impact between the piston 21 and anvil 25 will cause the piercing tool 20 to extend (while remaining captive with the body 10) and pierce the window. The window will shatter and a fire-controlling fluid can then be supplied to the interior of the aircraft by the nozzle 12.

20

The aid described above has the advantage that it has no significant recoil. This is because the reaction force applied to the end part 15 when the piston 21 is suddenly exposed to the full pressure of the compressed gas in the reservoir 22 does not generate much energy before the piston 21 strikes the anvil 25 and produces a force in the opposite direction. In fact, the net effect of these forces is to pull the

fire-fighting aid forwards. It is however quite important to keep the mass of the piston relatively small as the recoil is dependent on the momentum of the piston (mass x velocity) and the impact velocity high as
5 the force applied to the anvil 25 is dependent on the kinetic energy of the piston (mass x the square of the velocity). The absence of any significant recoil enables the fire-fighting aid to be hand held by an operator. This is also important, however, when the aid
10 is mounted on the end of an extendible/retractable boom, as any significant recoil would cause the boom to move away from the window when the piercing device is operated.

15 The piercing device 11 can be reset by connecting the vent tube 31 to gas under pressure instead of to atmosphere. This can be done with an appropriate valve system.

20 In some circumstances, it may be desirable to be able to move the inner tubular part 13 and the end part 15 relative to the outer tubular part 14. This could be achieved by a further piston (not shown), which is attached to the inner tubular part 13 and arranged in
25 the chamber 17, and an appropriate porting arrangement.

In an alternative embodiment, the piston 21 and piercing tool 20 could be of unitary construction

so that the piercing tool 20 moves forwards with the piston 21. In this case, the piston may have an associated piston rod of hollow tubular construction surrounding all but the tip of the piercing tool and the
5 piston rod and piston may be slidable in respective guides formed in the body of the fire-fighting aid.

The above embodiments are given by way of example only and various modifications will be apparent
10 to persons skilled in the art without departing from the scope of the invention.

C L A I M S

1. A fire-fighting aid comprising a piercing device for piercing a hole in a structure, such as an aircraft fuselage, in combination with a nozzle for supplying a fire-controlling fluid through a hole formed in the structure by the piercing device, the piercing device comprising a piercing tool, means supporting the piercing tool for movement between a retracted position and an extended position, and means for applying a force to the piercing tool to drive the piercing tool from its retracted position to its extended position to in use form a hole in the structure.

2. A fire-fighting aid as claimed in claim 1, wherein the nozzle and piercing device have a common body.

3. A fire-fighting aid as claimed in claim 2, wherein the nozzle surrounds the piercing tool in the body.

4. A fire-fighting aid as claimed in any one of the preceding claims, wherein the force applying means comprises a piston slidable between a first position remote from the piercing tool and a second position in which it impacts with the piercing tool to drive the piercing tool from its retracted to its extended

position, and means for propelling the piston towards its second position.

5. A fire-fighting aid as claimed in any one of
5 claims 1 to 3, wherein the force applying means comprises a piston slidable between a first position and a second position to drive the piercing tool from its retracted to its extended position, the piston and piercing tool being of unitary construction, and means
10 for propelling the piston towards its second position.

6. A fire-fighting aid as claimed in claim 4 or claim 5, wherein the propelling means comprises a gas reservoir for supplying pressurised gas to one end of
15 the piston when the piston has been moved away from its first position and means for moving the piston away from its first position so that in use said one end of the piston is exposed to pressurised gas in the gas reservoir.

20

7. A fire-fighting aid as claimed in any one of the preceding claims, wherein the aid is in the form of a hand-holdable aid.

25 8. A fire-fighting aid as claimed in any one of claims 1 to 6, wherein the aid is mounted on an extendible/retractable boom.

9. A fire-fighting aid substantially as hereinbefore described with reference to the accompanying drawings.

12.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) A5A (A20X5, A14G)

(ii) Int Cl (Edition 5) A62C

Search Examiner

DR C L DAVIES

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

9.10.92

Documents considered relevant following a search in respect of claims 1-9

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 587639 A (WALTER KIDDE)	1,2,5,6, 7
X,E	US 5062486 A (McCLENAHAN) 5 November 1991 see whole document	1,2,4,7
X	US 4832265 A (ANFOSSO) see whole document	1,2,4,5, 7
X	US 4625808 A (HALFPENNY) see whole document	1,2,5,6, 7
X	US 4147216 A (SCHNEPFE) see whole document	1,2,7,4,5
X	US 2857005 A (MEDLOCK) see whole document	1,2,8

Category	Identity of document and relevant passages	Relevance to claim(s)

Categories of documents

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

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